

## Moles and Rxns

## Stoichiometry A2



Coefficients tell us # of moles

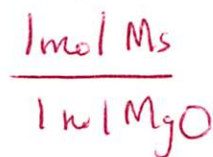
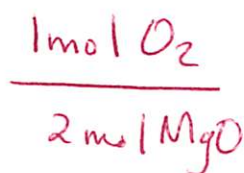
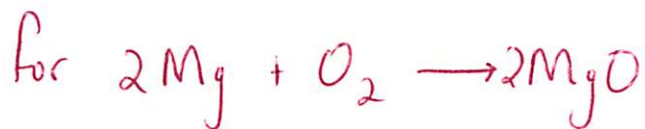
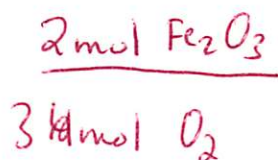


Whole Basis behind this idea is a Ratio.

~~How many~~ Compare Iron to  $\text{O}_2$   $4 \text{mol Fe} : 3 \text{mol O}_2$

Can ~~use~~ make this as a fraction  $\frac{4 \text{mol Fe}}{3 \text{mol O}_2}$  or  $\frac{3 \text{mol O}_2}{4 \text{mol Fe}}$

Iron oxide to Oxygen



do worksheet.  
of Ratios

## Now Stoichiometry (mass Relationships in Rxns)

First kind mol-mol Relies totally on  
molar Ratios

Convert from mol of one ~~to~~ compound in a Rxn to  
another



If 4 mol of Fe used how many mol  $\text{O}_2$  needed?

(Use molar Ratio to convert) Convert from: Fe  
" to  $\text{O}_2$

$$4\cancel{\text{mol Fe}} \times \frac{3\text{mol O}_2}{4\cancel{\text{mol Fe}}} = 3 \text{ mol O}_2$$

↑  
From Rxn. Use coefficients to make Ratio of moles  
you know there is 3 mol of  $\text{O}_2$  to 4 mol of Fe so just  
make conversion so it flips

what if 2 mol Fe How many mol of  $\text{O}_2$

$$2\text{mol Fe} \times \frac{3\text{mol O}_2}{4\text{mol Fe}} = 1.5 \text{ mol O}_2$$

half as much  $\text{O}_2$   
b/c half as much  
Fe!



If <sup>8</sup> ~~0~~ mol of P how many mol  $O_2$ ? mol  $P_2O_5$ ?

do sheet of problems

Flow chart

In Rxn

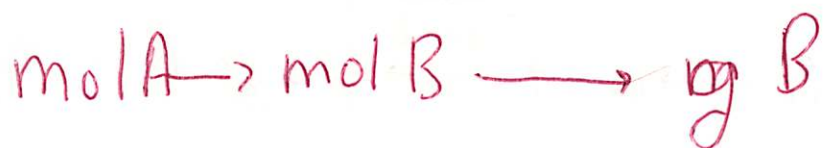


if go mol A  $\rightarrow$  mol C

$$\text{mol A} \times \frac{\# \text{ mol C}}{\# \text{ mol A}} = \text{mol C}$$

Coefficient  $\rightarrow$

or mol to mass



$$\text{Step 1} \times \frac{\text{mol B}}{\text{mol A}}$$

Convert to  
mol B  
using coefficients

$$\text{Step 2} \times \frac{\text{g B}}{\text{mol B}}$$

Convert to  
mass using  
molar mass



If 4.0 mol of  $\text{H}_2$  used how many g of  $\text{N}_2$  needed?

Step 1. Convert to  
mol of  
 $\text{N}_2$

$$4.0 \text{ mol H}_2 \times \frac{1 \text{ mol N}_2}{3 \text{ mol H}_2} = 1.3 \text{ mol N}_2$$

Step 2 convert to  
mol  $\text{NH}_3$

$$1.3 \text{ mol N}_2 \times \frac{28.0 \text{ g N}_2}{1 \text{ mol N}_2} = 37 \text{ g N}_2$$

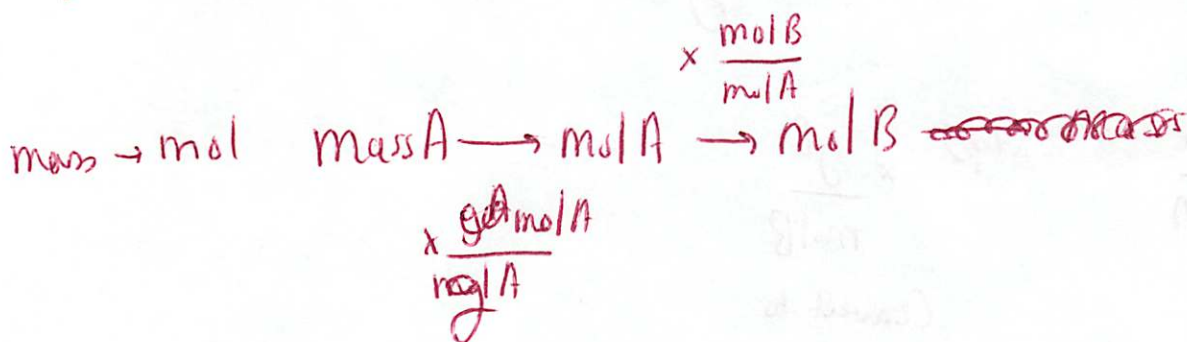
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If 2.1 mol  $\text{NH}_3$  produced how many g of  $\text{N}_2$  used?

$$2.1 \text{ mol NH}_3 \times \frac{3 \text{ mol H}_2}{2 \text{ mol NH}_3} \times \frac{2.0 \text{ g H}_2}{\text{mol H}_2} = \boxed{6.3 \text{ g H}_2}$$



# Compare processes



Do Wksh

# Mass - Mol / Mol - Mass Stoch

We don't measure in ~~grams~~<sup>mols</sup> we use grams

So lets factor in grams into Stoch

Review  $g \rightarrow mol$

$$\begin{array}{r} g \rightarrow mol \\ \times \frac{1 mol}{\times g} \\ \hline \end{array}$$

↑  
Molar Mass

$$\begin{array}{r} mol \rightarrow g \\ \times \frac{\times g}{1 mol} \\ \hline \end{array}$$

Try 16.0g of NaCl = ? mol/NaCl

$$16.0g \times \frac{1 mol NaCl}{58.5g NaCl} = 0.27 mol/NaCl$$

→  
Now work into  
Stoch

# Flow chart

mass - mol



$$\times \frac{1 \text{ mol } A}{\text{g } A}$$

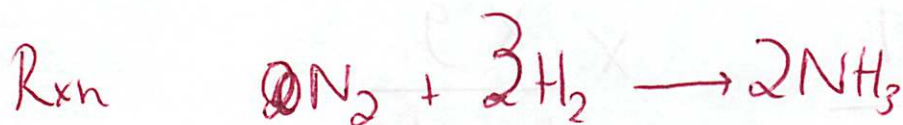
Molar Mass

Step 1 Convert  
to mol A

$$\times \frac{0 \text{ mol } B}{1 \text{ mol } A}$$

Coefficient

Step 2  
Convert to mol B



If 12.0g of  $\text{H}_2$  are used How many mol  $\text{NH}_3$  yielded?

Step 1 convert to mol  $\text{H}_2$   $12.0\text{g } \text{H}_2 \times \frac{1 \text{ mol } \text{H}_2}{2 \text{ g } \text{H}_2} = 6 \text{ mol } \text{H}_2$

Step 2 Convert to mol  $\text{NH}_3$

$$6 \text{ mol } \text{H}_2 \times \frac{2 \text{ mol } \text{NH}_3}{3 \text{ mol } \text{H}_2} = \boxed{4 \text{ mol } \text{NH}_3}$$

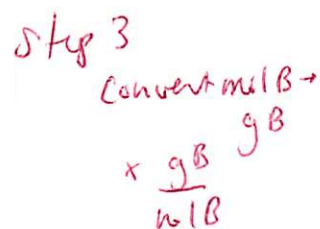
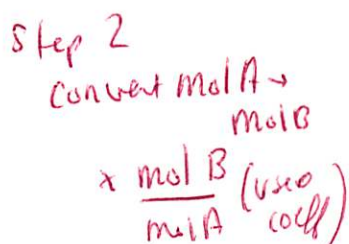
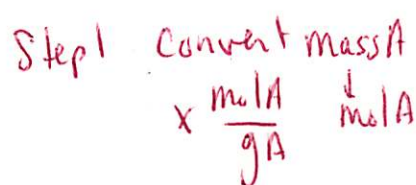
If 6g of  $\text{N}_2$  used, How many mol  $\text{H}_2$  needed?

$$6\text{g } \text{N}_2 \times \frac{1 \text{ mol } \text{N}_2}{28 \text{ g } \text{N}_2} = 0.214 \text{ mol } \text{N}_2 \times \frac{3 \text{ mol } \text{H}_2}{1 \text{ mol } \text{N}_2} = \boxed{0.642 \text{ mol } \text{H}_2}$$

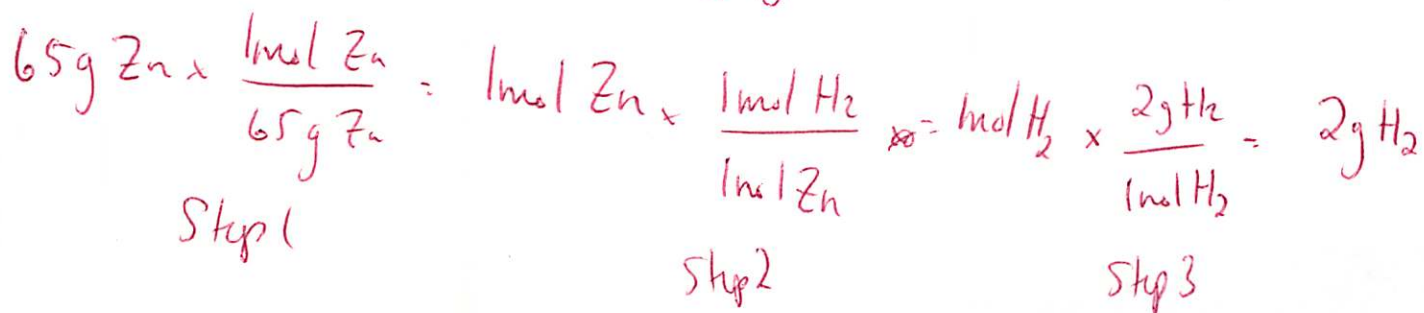
Now the Culmination of over a week of work.

## Mass to Mass Stoichiometry!

2 Flow charts



If 65 g of Zn are used How many g of  $\text{H}_2$  are produced?





# % Yield, Theoretical yield, Actual Yield

Theoretical yield  $\rightarrow$  max amount of product ~~calculated~~ that can be ~~theoretically~~ obtained in a rxn (mathematically determined).

Actual yield  $\rightarrow$  actual amount of product obtained in a rxn (experimentally observed)

$$\text{Percent yield} \rightarrow \frac{\text{actual}}{\text{theoretical}} \times 100\%$$



Find % yield.

1st  
Theoretical  $36.8\text{g} \times \frac{1\text{ mol}}{78.1\text{g}} \times \frac{1\text{ mol C}_6\text{H}_5\text{Cl}}{1\text{ mol C}_6\text{H}_6} \times \frac{113\text{g C}_6\text{H}_5\text{Cl}}{\text{mol C}_6\text{H}_5\text{Cl}} = 53.2\text{g C}_6\text{H}_5\text{Cl}$

$$\% = \frac{38.8\text{g}}{53.2\text{g}} \times 100\% = 72.9\%$$